AQUATIC INVERTEBRATES AND HABITAT AT A FIXED STATION ON THE BOULDER RIVER, SWEETGRASS COUNTY, MONTANA

July 24, 2001

A report to
the Montana Department of Environmental Quality
Helena, Montana

by
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INTRODUCTION

This report is one of 38 brief interpretive summaries of data assembled as part of a statewide, multi-year study conducted by the Montana Department of Environmental Quality (MT DEQ). Each report discusses information generated from a single benthic invertebrate sample collection and habitat evaluation at a fixed station established on a gauged river or high-order tributary. The present treatise focuses on the aquatic community sampled on the Boulder River at Big Timber, Montana on July 24, 2001. The sample site was located by GPS reading at 45° 50' 02" N, 109° 56' 17" W, lying within the Montana Valley and Foothill Prairies Ecoregion (Woods et al. 1998). The sample was collected by personnel of MT DEQ. Sampling effort consisted of either a composite of four Hess samples, or a one-minute kicknet collection (Bukantis 1998). Habitat parameters were evaluated using the MT DEQ Macroinvertebrate Habitat Assessment Field Form for streams with riffle/run prevalence. Invertebrate samples were processed and animals identified by Rhithron Associates, Inc. Analysis of invertebrate assemblages was accomplished by applying the revised method (Bollman 1998) for streams of Western Montana's ecoregions. The method uses a multimetric battery to evaluate disturbance to biotic integrity.

The revised bioassessment metric battery and its scoring criteria have not been evaluated for application to higher-order streams and rivers; to date, no bioassessment method has been contrived for these waterways in Montana. Thus, the method used here is likely to have limitations in its applicability to the sites in this study. Ninety-eight sites in Western Montana were used to assemble the revised metric battery and to test it for sensitivity in detecting impairment, to establish scoring criteria, and to improve robustness of bioassessment. These 98 sites were mainly second and third order streams; the sampling season roughly corresponded to that of the fixed-station study. Mean water temperature for these sites at the time of sampling was 15°C (median = 14°C).The sites sampled for the fixed stations study are quite different from these test streams. Twenty-five sites located in Western Montana were sampled between July 23 and August 25, 2001 for this study. All are riverine or high-order waterways. Mean water temperature for these sites at the time of sampling was 19.8°C (median = 19.4°). Temperatures ranged from 15.5°C (Kootenai River near Libby) to 25.3°C (Jefferson River near Three Forks). Natural variations in benthic community composition and structure along longitudinal and thermal gradients are well known phenomena. Thus, scores and classifications were established for much smaller systems with significantly lower water temperatures than those included in the fixed stations study group. Impairment classifications and use support designations in this study must be interpreted with care. Results from the application of other metric batteries may be found in the Appendix.

RESULTS AND DISCUSSION

Table 1 itemizes the nine evaluated habitat parameters and shows the assigned scores for each, as well as the integrated score and condition category.

Overall habitat conditions scored sub-optimally. Instream habitats were perceived to be impacted by some degree of fine sediment deposition. Streambanks were moderately stable, with some limitation to vegetative protection observed on the left bank. Flow was judged marginal; field notes indicate that flow was estimated at about 65% of normal.

Table 1. Stream and riparian habitat assessment for a fixed station on the Boulder River. July 2001.

Max. possible score	**Parameter**	Boulder River at Big Timber
10	Riffle development	10
10	Benthic substrate	10
20	Embeddedness	17
20	Channel alteration	13
20	Sediment deposition	14
20	Channel flow status	9
20	Bank stability: left / right	6 / 8
20	Bank vegetation: left / right	7 / 9
20	Vegetated zone: left / right	8 / 9
160	Total	120
	Percent of maximum CONDITION*	**75 SUB-OPTIMAL**

*Condition categories: Optimal > 80% of maximum score; Sub-optimal 75 - 56%; Marginal 49 - 29%; Poor <23%. Adapted from Platkin et al. 1998.

Table 2. Metric values, scores, and bioassessment for a fixed station on the Boulder River. The revised bioassessment metric battery (Bollman 1998) was used for the evaluation. July 2001.

	Boulder River at Big Timber	
METRICS	**METRIC VALUES**	**METRIC SCORES**
Ephemeroptera richness	8	3
Plecoptera richness	1	1
Trichoptera richness	5	3
Number of sensitive taxa	0	0
Percent filterers	47.6	0
Percent tolerant taxa	9.64	2
	TOTAL SCORE (max.=18)	9
	PERCENT OF MAX.	**50**
	Impairment classification	**MODERATE**
	USE SUPPORT	**PARTIAL**

Bioassessment results are given in Table 2. When this bioassessment method is applied to these data, scores indicate that this site on the Boulder River is moderately impaired and only partially supports designated uses.

Eight mayfly taxa were collected in the sample, and the biotic index calculated for the assemblage was 3.20; both of these findings suggest that no effects of impairment to water quality were detectable in the composition of the benthic community. Moderately high caddisfly taxa richness (5) and abundant "clinger" taxa (14) indicate that fine sediment deposition did not limit the availability of hard substrates for colonization. Only

a single stonefly was taken in the collection; low stonefly richness and abundance may be associated with reach-scale habitat disturbances, such as streambank instability, loss of riparian function, or alteration of natural channel morphology.

Filter-feeders, particularly the caddisfly *Brachycentrus occidentalis*, were the principal contributors to the functional structure of the assemblage, but filter-feeders are expected to be a dominant element in the benthic community of riverine sites. All other expected functional components were present in ample abundance at the site.

CONCLUSIONS

- Good water quality and habitat conditions supported a balanced, functional benthic assemblage at this site on the Boulder River.
- The bioassessment method appears to under-estimate the quality of the benthic fauna at this site. Given the diverse functional components, the taxonomic elements, and the tolerance characteristics of the assemblage, non-impairment of biotic health seems to be indicated.

LITERATURE CITED

Bollman, W. 1998. Improving Stream Bioassessment Methods for the Montana Valleys and Foothill Prairies Ecoregion. Master's (M.S.) Thesis. University of Montana. Missoula, Montana.

Bukantis, R. 1998. Rapid bioassessment macroinvertebrate protocols: Sampling and sample analysis SOP's. Working draft, April 22, 1997. Montana Department of Environmental Quality. Planning Prevention and Assistance Division. Helena, Montana.

Woods, A.J., Omernik, J. M. Nesser, J.A., Shelden, J., and Azevedo, S. H. 1999. Ecoregions of Montana. (Color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia. US Geological Survey.

APPENDIX

Taxonomic data and summaries

Boulder River

July 2001

Aquatic Invertebrate Taxonomic Data

Site Name: Boulder River at Big Timber **Date: 7/24/01**

Site ID: Y03BOULR01 Approx. percent of sample used 70

Taxon	Quantity	Percent	HBI	FFG
Nais bretscheri	1	0.30	8	CG
Eiseniella tetraedra	2	0.60	8	CG
Fossaria sp.	1	0.30	6	SC
Physidae	2	0.60	8	SC
Total Misc. Taxa	**6**	**1.81**		
Acentrella insignificans	16	4.82	4	CG
Baetis tricaudatus	11	3.31	4	CG
Diphetor hageni	2	0.60	5	CG
Attenella margarita	14	4.22	2	CG
Drunella grandis	1	0.30	2	CG
Epeorus albertae	12	3.61	2	CG
Nixe sp.	6	1.81	4	SC
Paraleptophlebia sp.	2	0.60	1	CG
Total Ephemeroptera	**64**	**19.28**		
Isogenoides sp.	1	0.30	3	PR
Total Plecoptera	**1**	**0.30**		
Arctopsyche grandis	3	0.90	2	PR
Brachycentrus occidentalis	150	45.18	2	CF
Glossosoma sp	17	5.12	0	SC
Hydropsyche sp.	3	0.90	5	CF
Psychomyia sp	1	0.30	2	CG
Total Trichoptera	**174**	**52.41**		
Oreodytes sp.	1	0.30	5	PR
Optioservus sp.	10	3.01	5	SC
Zaitzevia sp	2	0.60	5	CG
Total Coleoptera	**13**	**3.92**		
Atherix sp.	1	0.30	4	PR
Ceratopogonmae	1	0.30	6	PR
Chelifera sp	4	1.20	5	PR
Simulium sp.	1	0.30	5	CF
Hexatoma sp.	5	1.51	2	PR
Total Diptera	**12**	**3.61**		
Cladotanytarsus sp.	1	0.30	7	CG
Cricotopus (Isocladius) Gr	3	0.90	7	CG
Eukiefferiella Graceri Gr	1	0.30	8	CG
Eukiefferiella Pseudomontana Gr	2	0.60	8	CG
Labrundinia	3	0.90	7	PR
Microtendipes sp.	1	0.30	6	CF
Paratanytarsus sp	5	1.51	6	UN
Polypedilum sp	40	12.05	6	SH
Tanytarsus sp	3	0.90	6	CF
Thienemanniella sp	2	0.60	6	CG
Tvetenia sp	1	0.30	5	CG
Total Chironomidae	**62**	**18.67**		
Grand Total	**332**	**100.00**		

Aquatic Invertebrate Summary

Site Name: Boulder River at Big Timber **Date: 7/24/01**

Site ID: Y03BOULR01

SAMPLE TOTAL	332
EPT abundance	239
TAXA RICHNESS	37
Number EPT taxa	14
Percent EPT	71 99

DOMINANCE

TAXON	ABUNDANCE	PERCENT
Brachycentrus occidentalis	150	45 18
Polypedilum sp	40	12 05
Glossosoma sp	17	5 12
Acentrella insignificans	16	4 82
Attenella margarita	14	4 22
SUBTOTAL 5 DOMINANTS	237	71 39
Epeorus albertae	12	3 61
Baetis tricaudatus	11	3 31
Optioservus sp	10	3 01
Nrte sp	6	1 81
Hexatoma sp	5	1 51
TOTAL DOMINANTS	281	84 64

SAPROBITY

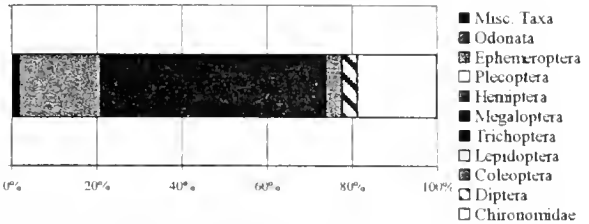
Hilsenhoff Biotic Index	3 20

DIVERSITY

Shannon H (loge)	1 93
Shannon H (log2)	2 79
Simpson D	0 19

TAXONOMIC COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Misc Taxa	1 81	4	6
Odonata	0 00	0	0
Ephemeroptera	19 28	8	64
Plecoptera	0 30	1	1
Hemiptera	0 00	0	0
Megaloptera	0 00	0	0
Trichoptera	52 41	5	174
Lepidoptera	0 00	0	0
Coleoptera	3 92	3	13
Diptera	3 61	5	12
Chironomidae	18 67	11	62



VOLTINISM

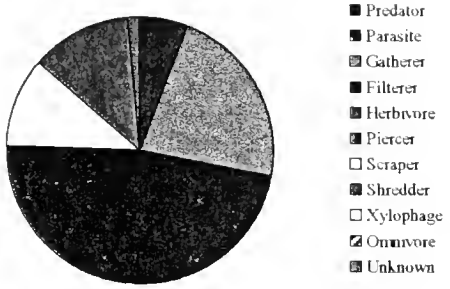
TYPE	ABUNDANCE	PERCENT
Multivoltine	69	20 78
Univoltine	97	29 22
Semivoltine	166	50 00

TAXA CHARACTERS

	#TAXA	ABUNDANCE	PERCENT
Tolerant	8	32	9 64
Intolerant	0	0	0 00
Clinger	14	265	79 82

FUNCTIONAL COMPOSITION

GROUP	PERCENT	#TAXA	ABUNDANCE
Predator	5 72	8	19
Parasite	0 00	0	0
Gatherer	22 29	17	74
Filterer	47 59	5	158
Herbivore	0 00	0	0
Piercer	0 00	0	0
Scraper	10 84	5	36
Shredder	12 05	1	40
Xylophage	0 00	0	0
Omnivore	0 00	0	0
Unknown	1 51	1	5



BIOASSESSMENT INDICES

B-IBI (Karr et al)

METRIC	VALUE	SCORE
Taxa richness	37	3
E richness	8	3
P richness	1	1
T richness	5	3
Long-lived	5	5
Sensitive richness	0	1
%tolerant	9 64	5
%predators	5 72	1
Clinger richness	14	3
%dominance (3)	62 35	3
	TOTAL SCORE	28

56 %

MONTANA DEQ METRICS (Bukantis 1998)

METRIC	VALUE	Plains Ecoregions	Valleys and Foothills	Mountain Ecoregions
Taxa richness	37	3	3	3
EPT richness	14	3	2	0
Biotic Index	3 20	3	3	2
%Dominant taxon	45 18	1	1	0
%Collectors	69 88	2	2	2
%EPT	71 99	3	3	3
Shannon Diversity	2 79	2		
%Scrapers +Shredd	22 89	2	2	0
Predator taxa	8	3		
%Multivoltine	20 78	3		
%H of T	1 7		3	
TOTAL SCORES		25	19	10
PERCENT OF MAXIMUM		83 33	79 17	47 62
IMPAIRMENT CLASS		NON	SLIGHT	MODERATE

COMMUNITY TOLERANCES

Sediment tolerant taxa	3
Percent sediment tolerant	2 41
Sediment sensitive taxa	3
Percent sediment sensitive	6 33
Metals tolerance index (McGuire)	3 14
Cold stenotherm taxa	0
Percent cold stenotherms	0 00

Montana DEQ metric batteries